

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 20 JUN 2006

PCT

Applicant's or agent's file reference 49907-PT	<div style="display: flex; justify-content: space-between;"> <div>FOR FURTHER ACTION</div> <div>See Form PCT/IPEA/416</div> </div>	
International application No. PCT/CA2005/000248	International filing date (<i>day/month/year</i>) 23 February 2005 (23-02-2005)	Priority date (<i>day/month/year</i>) 24 February 2004 (24-02-2004)
International Patent Classification (IPC) or national classification and IPC IPC: B22D 43/00 (2006.01) , B22D 27/00 (2006.01) , B22D 21/04 (2006.01) , B01D 35/02 (2006.01)		
Applicant ALCAN INTERNATIONAL LIMITED ET AL		
<ol style="list-style-type: none"> 1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: <ol style="list-style-type: none"> a. <input type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>08</u> sheets, as follows: <div style="margin-left: 20px;"> <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. 1 and the Supplemental Box. </div> b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) <div style="margin-left: 20px;"> , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions). </div> 4. This report contains indications relating to the following items: <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application </div> 		
Date of submission of the demand 04 October 2005 (04-10-2005)	Date of completion of this report 9 June 2006 (09-06-2006)	
Name and mailing address of the IPEA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001(819)953-2476	Authorized officer <div style="text-align: right;"> Malcolm Downey (819) 934-2329 </div>	

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/CA2005/000248

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of:
 - ☐ international search (Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (Rule 12.4(a))
 - ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
 - ☐ the international application as originally filed/furnished
 - ☒ the description:

<input checked="" type="checkbox"/> pages <u>1-12</u>		as originally filed/furnished
<input checked="" type="checkbox"/> pages* <u>13</u>	received by this Authority on	<u>5 May 2006 (05-05-2006)</u>
<input type="checkbox"/> pages*	received by this Authority on	
 - ☒ the claims:

<input type="checkbox"/> pages		as originally filed/furnished
<input type="checkbox"/> pages*	as amended (together with any statement) under Article 19	
<input checked="" type="checkbox"/> pages* <u>14-17</u>	received by this Authority on	<u>5 May 2006 (05-05-2006)</u>
<input type="checkbox"/> pages*	received by this Authority on	
 - ☒ the drawings:

<input type="checkbox"/> pages		as originally filed/furnished
<input checked="" type="checkbox"/> pages* <u>1/5</u>	received by this Authority on	<u>6 May 2005 (06-05-2005)</u>
<input type="checkbox"/> pages* <u>2/5-5/5</u>	received by this Authority on	<u>4 October 2005 (04-10-2005)</u>
 - ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/CA2005/000248**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	<u>1-22</u>	YES
	Claims	<u>None</u>	NO
Inventive step (IS)	Claims	<u>1-22</u>	YES
	Claims	<u>None</u>	NO
Industrial applicability (IA)	Claims	<u>1-22</u>	YES
	Claims	<u>None</u>	NO

2. Citations and explanations (Rule 70.7)

Reference is made to the following documents:

D1: US 5,827,982 (Alcan International Limited) 27-10-1998

D2: JP 60-005829 (Nippon Light Metal Company) 12-01-1985

Document D1 discloses a device for measuring metal purity, comprising a receptacle for holding a sample of molten metal, the receptacle having a bottom wall provided with a hole containing a filter element. The bottom wall is substantially impermeable to air except at the hole. An enclosed collection vessel is positioned below the receptacle for collecting molten metal which passes through the filter element from the receptacle, the collection vessel having an opening permitting extraction of gas from within the vessel to enable a vacuum to be generated within the vessel during use of the device. A leak-tight seal is established between the receptacle for molten metal and the collection vessel to permit vacuum generated in the collection vessel to draw molten metal into the collection vessel from the receptacle through the filter. The vacuum may be applied using a vacuum pump of conventional design, but is more conveniently applied by means of an air aspirator which can operate on a plant air supply. Optionally, a vacuum regulator may be used to control the vacuum in the collection chamber to a fixed value to achieve a relatively constant pressure drop along the apparatus. However, D1 fails to disclose a vertically movable closure unit adapted to sit over and seal the opening between the discharge trough and a means for raising and lowering the closure unit.

Document D2 discloses a filter device and evacuated vessels which are operated to evacuate a vacuum tank to a required pressure to filter molten metal through an inlet spout to a molten metal well. Consequently, D2 teaches the use of a vacuum to prime a filter for use in producing ultra-pure metal wherein the outlet is maintained under a negative pressure through the vessel during priming. Once started, the filtration is continuously accomplished at the head and therefore, there is no need to apply negative pressure which, as a result, is stopped and the evacuated vessel is removed and a cover is applied. However, the Applicants were faced with the problem of trying to prime large commercial filters, which have large cross sectional areas compared to the thickness of the filter. It was determined that for the level of vacuum required in D2, a vacuum pump was required which would be unable to remove air from a commercial exit well sufficiently fast. Attempts were made in the instant application to use a vacuum tank such as that disclosed in D2, however, this approach created an uncontrollable, high evacuation rate which could result in insufficient final pressure if not leak tight.

Consequently, the subject-matter of claims 1-22 appears to be novel and involve an inventive step, and thus meet the requirements of Articles 33(2) and 33(3) PCT. The subject-matter of claims 1-22 appears to be industrially applicable and thus meet the requirements of Article 33(4) PCT.

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valve and a three-way valve for bleeding atmospheric air into the air being drawn into the fan.

Molten aluminum alloy was added to the filtration unit to a depth of about 20 cm (8 inches) above the filter.

5 With the exit well and molten metal outlet trough closed, the fan was started and a three-way valve progressively moved by a motor to draw an increasing proportion of air from the exit well and a decreasing proportion of air from the atmosphere. The filter is primed within about 10
10 seconds, at which point the vacuum had reached a level of about 6 kPa. At this point the venting valve in the conduit was opened and the exit well and molten metal outlet were also immediately opened. The results are shown in the graph in Figure 6 where line 62 shows a
15 steadily decreasing pressure and the point 64 indicates the point at which metal is detected in the bottom of the exit well 26 showing that priming has been achieved.

CLAIMS:

1. A method of priming an in-line molten metal filtration unit having a porous ceramic or refractory filter mounted substantially horizontally in a filter box having an inlet for the molten metal and an outlet for the molten metal, the outlet being a closeable outlet in an exit well connecting to the downstream side of the filter,

the method comprising the steps of adding sufficient molten metal to the filter box to fully cover the upstream side of the filter with molten metal, closing the molten metal outlet in the exit well with a sealable cover, applying a steadily increasing vacuum to the closed exit well at a rate between 0.1 and 10 kPa per second by withdrawing a stream of air from the exit well through a fan or air venturi until the molten metal begins to flow through the filter and then immediately releasing the vacuum and removing the sealable cover from the molten metal outlet.

2. A method as claimed in claim 1 wherein the fan is connected to the exit well of the filter box by way of a conduit having a valve for venting to the atmosphere and the vacuum is released by opening this valve to the atmosphere.

3. A method as claimed in claim 2 wherein the conduit is connected to the sealable cover and when the vacuum is to be released the sealable cover is removed from the exit well and molten metal outlet.

4. A method as claimed in claim 2 wherein the conduit also includes a three way valve for bleeding atmospheric air into the air stream being drawn into the fan.
5. A method as claimed in claim 4 wherein the priming is conducted within a time of about 1 to 120 seconds.
6. A method as claimed in claim 5 wherein the time is about 2 to 30 seconds.
7. A method as claimed in claim 5 wherein the filter has a filtration area of about 25 to 10130 square centimeters (4 to 1570 square inches).
8. A method as claimed in claim 5 wherein the filtration area is at least 645 square centimeters (100 square inches).
9. A method as claimed in claim 5 wherein the filter has a thickness of about 1.25 to 10.2 centimeters (0.5 to 4.0 inches).
10. A method as claimed in claim 9 wherein the thickness of the filter is about 2.5 to 7.6 centimeters (1 to 3 inches).
11. A method as claimed in claim 9 wherein the filter has an average pore size of about 150 to 500 microns.
12. An apparatus for filtering molten metal comprising a filter box, a feed trough for feeding molten metal into the filter box, a porous ceramic or refractory filter mounted substantially horizontally within the filter box to receive molten metal from the feed trough, an exit

well beneath the filter for receiving filtered molten metal, said exit well extending laterally beyond the filter box and beneath a bottom portion of a discharge trough, said trough bottom portion having an opening connecting the discharge trough to the exit well, a vertically movable closure unit adapted to sit over and seal the opening between the discharge trough and exit well, an air conduit connected at a first end to the closure unit and at a second end to a fan or air venturi for withdrawing air from the exit well, a valve for releasing vacuum formed in the exit well and means for raising and lowering the closure unit.

13. An apparatus as claimed in claim 12 wherein the air conduit second end includes a three-way valve for bleeding atmospheric air into the air in the conduit being withdrawn from the exit well.

14. An apparatus as claimed in claim 12 wherein the fan or venturi is adapted to apply a steadily increasing vacuum to the exit well at a rate between 0.1 and 10 kPa per second.

15. An apparatus as claimed in claim 12 wherein the valve for releasing vacuum is connected to the vertically movable closure unit.

16. An apparatus as claimed in claim 15 wherein the vertically movable closure unit includes electrical contacts extending from the bottom thereof for detecting the presence of molten metal.

17. An apparatus as claimed in claim 12 wherein the filter box includes a removable cover.

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18. An apparatus as claimed in claim 12 wherein the filter has a filtration area of about 25 to 10130 square centimeters (4 to 1570 square inches).

19. An apparatus as claimed in claim 12 wherein the filtration area is at least 645 square centimeters (100 square inches).

20. An apparatus as claimed in claim 12 wherein the filter has a thickness of about 1.25 to 10.2 centimeters (0.5 to 4.0 inches).

21. An apparatus as claimed in claim 12 wherein the thickness of the filter is about 2.5 to 7.6 centimeters (1 to 3 inches).

22. An apparatus as claimed in claim 12 wherein the filter has an average pore size of about 150 to 500 microns.

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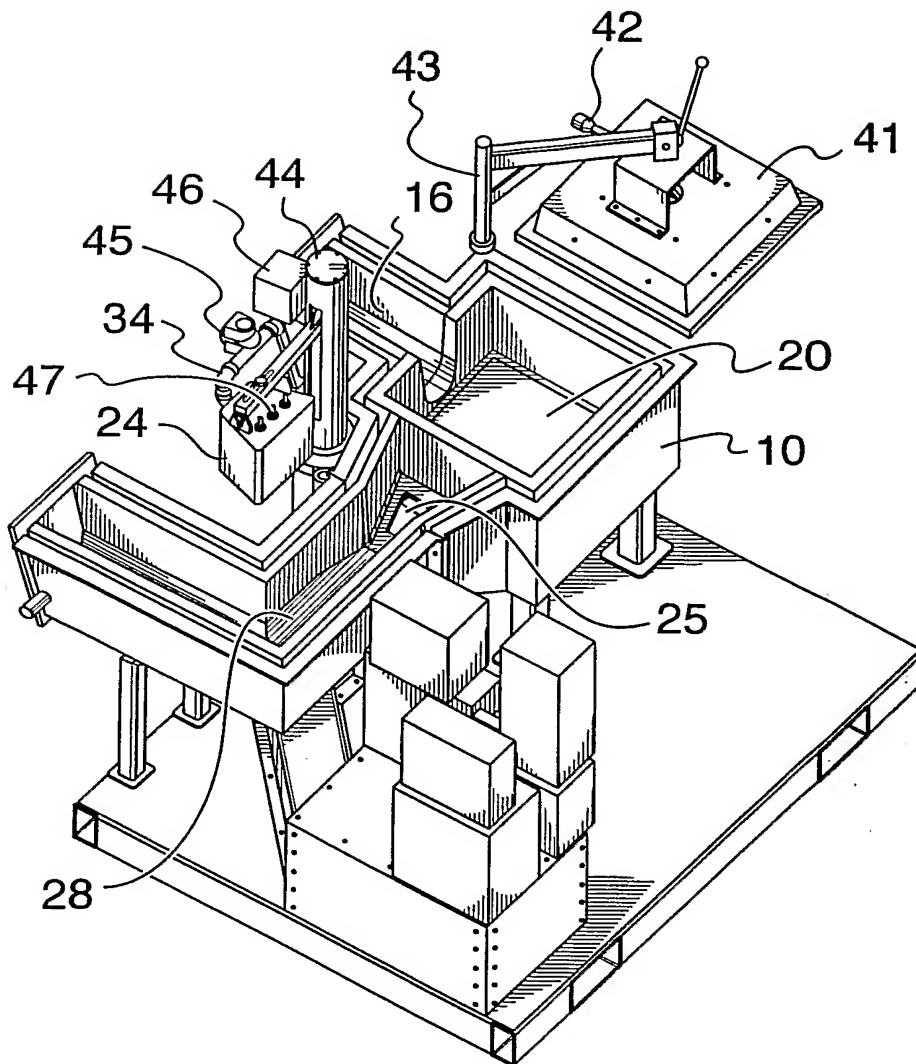


FIG. 3

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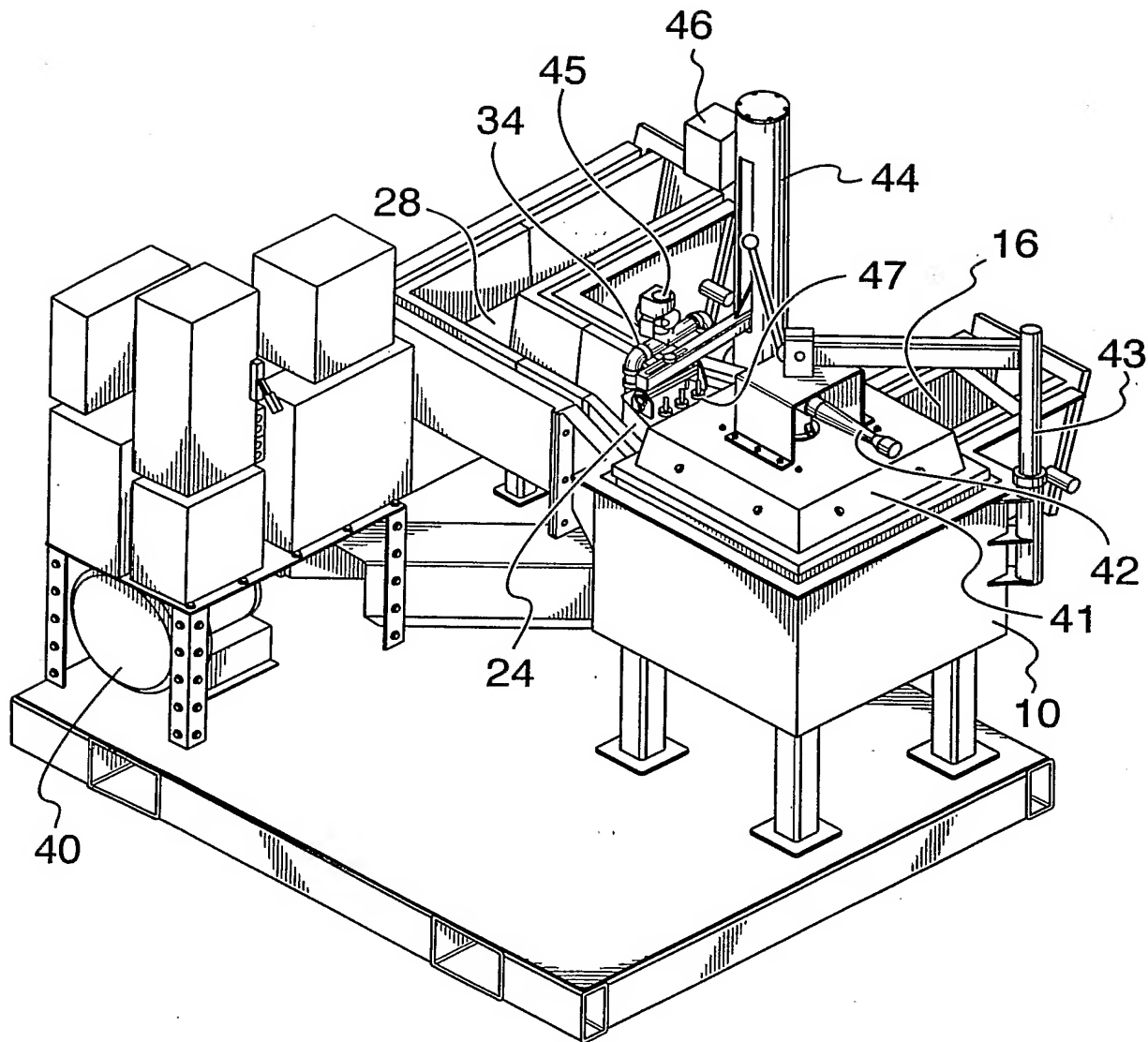


FIG. 4

AMENDED SHEET

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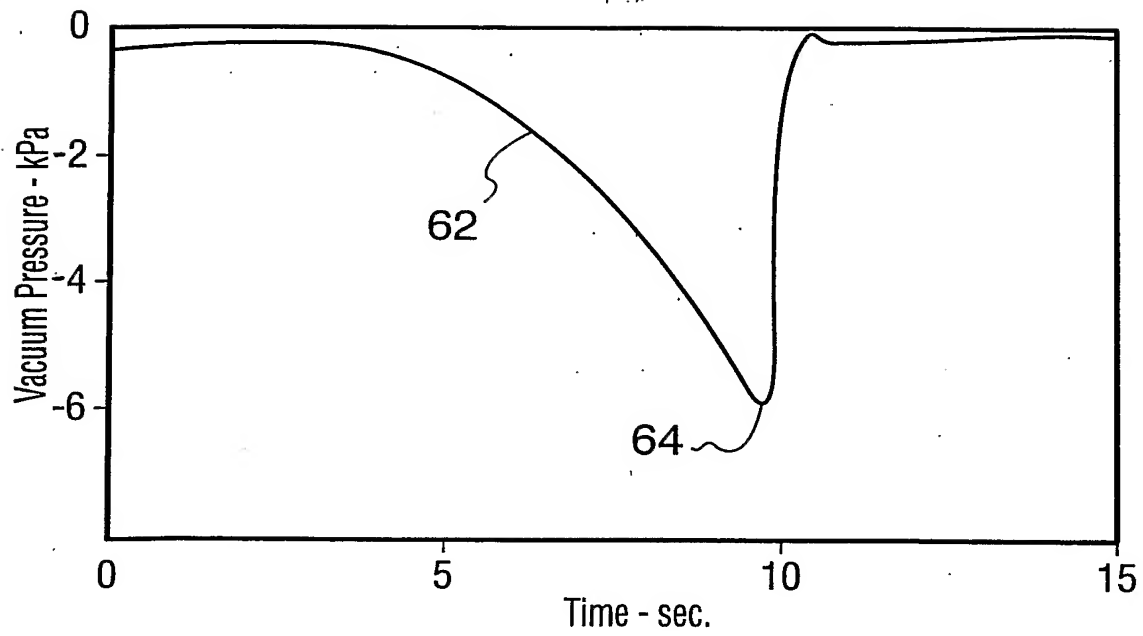


FIG. 6